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ABSTRACT

According to dictionary definitions, the concept of "technology" does not have to involve hardware, but refers instead to the application of scientific methods or scientifically derived knowledge to a practical task. Despite the availability of complex new instructional hardware to teachers, very little in the way of pedagogical technology has been effectively provided them. They rely instead on tradition, common sense, and charisma, and often adopt the attitude of "know-nothingism" that goes along with these imprecise guides to teaching practice. Such attitudes prevent the development of commonly understood information about teaching. The most powerful technology available to teachers today is based on the psychological and biological principles underlying human growth and development, yet too few teachers know, understand, or can apply the concepts drawn from these fields to their work with students. Until a technology of teaching is developed that will help teachers understand the impact and effective utilization of the tools at their disposal, training teahcers to use advanced hardware may only lead to their having greater impact in their incompetence. (PGD)

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PUBLIC POLICY AND LEARNING TECHNOLOGY: ON THE TRAIL OF THE RED HERRING

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An Abstract

This article examines issues raised by the National Commission on Excellence in Education. It contends that one of the most crucial issues involved in improving the nation's schools is improving the nation's teachers. It argues that the best prospect for improving these teachers is to base their training on what is termed the new technology of teaching.

A modified version of this paper concentrating on the implication of teacher education has been submitted to the Journal of Teacher Education for possible publication. Preston Feden, Ed.D. from La Salle University co-authored this effort and has made significant contributions to this paper.

Despite unprecedented indictments of the nation's schools and teachers, we continue to be preoccupied with issues that, if examined closely, turn out not only to be peripheral to the issue of teacher quality but often function as "red herrings," laying out false scent trails which lead us on exciting but non-productive chases.

The most recent of these "red herrings" involves micro-computers in the classroom. This technology could make an important contribution to education, but it is unlikely that they will if the quality of our teacher training programs are not only upgraded, but reconceptualized. What the current faddish popularity regarding micro-computers in education really reveals is a fundamental misunderstanding of the nature of the interrelationships between an occupation and the knowledge and skills needed by its practioners.

Speculation about the application of technology to the process of schooling usually involves telecommunications, micro-computers and the like. It seldom involves rethinking the way that technology and education both can and must interact.

In its broadest sense the term "technology" refers to applied science. According to Webster (New World Dictionary, p. 1496), nothing more than the direct application of scientifically derived principles and knowledge to the accomplishment of a practical task is required to correctly call something a technology. No hardware is required.

There is more than a simple definitional misunderstanding involved in our customarily too limited and too common way of defining technology -- particularly when we are discussing teaching. The fact of the matter is that this limited view reflects a fundamental misconception regarding the relationship of technology to instruction teaching is an occupation largely devoid of its own technology. That is at the heart of the matter.

The ineffectiveness of many of our teachers is largely due to their ignorance of a real pedagogical technology. An ignorance, by the way, which is more a fault of others than themselves. Instead of relying on scientific knowledge regarding how it is that we humans grow, develop, and learn and how we are influenced in these processes by our society to make these decisions, teachers are typically content to rely upon tradition, "common sense," their own previous educational experiences and force of character. That is why they so frequently cannot go beyond the textbook and manufactured teaching guides without foundering.

Even at the university level we are still frequently encumbered by an almost magical notion of what good teaching amounts to. Instead of at least seeking to understand the success or failure of teaching in some empirically verifiable way, university professors themselves often times subscribe to the view that teaching is an art, and that we cannot truly hope to ever plumb its wholeness without also pulling it asunder -- ultimately killing it in the process of examining it. In fact one suspects that many of these same professors secretly harbor the notion that it is through "charisma" in the Weberian sense of that term, that the truly excellent teacher prevails over ignorance. Through their zeal, their devotion and their strength they maintain their effectiveness. It is not so much through craft or science as it is through strength in life that one can be a great pedagogue (Weber, 1965, New Translation).

Such views are obviously seductive to anyone who fancies himself a good teacher. But the fact of the matter is that such attitudes have a rather heavy dose of know-nothingism associated with them. (This is the kind of anti-intellectualism, by the way, which these self-same professors would vigorously decry if it were attached to their own field of study). More importantly, such attitudes go a long way in explaining the ineffectual teaching which characterizes so many professors.

In this kind of an atomosphere that seems to pervade even higher education it is difficult for those who would upgrade teacher training through the provision of a scientifically derived core curriculum to make much headway. Instead they are often denounced as naive or shallow technocrates by colleagues who have a vested interest in preserving the mystery of the service they perform.

There are those who claim that teachers already practice an informal technology of instruction, that their techniques are based upon examination of the real world around them and that they truly do recognize similarities and acknowledge relevent distinctions. It is just that they do not dress them in a pseudo-scientific jargon. While this may be true, it is still the case that this is usually as far as the connection between their craft and science goes. For example, far too many teachers still subscribe to the notion that students who do poorly do so because of some sort of moral deficiency or defect of the will. They are simply "lazy," "worthless," or "couldn't care less." While we are not suggesting that the concept of "will" has no explanatory power or even that some students are not "worthless" in a colloquial sense, notions such as these are only a tad more sophisticated than the idea of demon possession. They offer absolutely no basis for discriminating between signicant and insignificant similarities in students with motivational problems or students who are experiencing various sorts of learning difficulties.

We are not saying that teachers who deal in the notion of "will" and the like are either ignorant or unobservant. No, their problem is that the criteria through which they observe and process information cannot be stated either explicitly or accurately nor can they be commonly shared with others. Their language lacks precision and their observations lack focus. This is a serious flaw. Until teachers begin to share a common technical criteria and viewpoints they will never be able to simplify, classify or even discuss in any useful way the task of teaching. Only

after teachers have accepted such a technology of instruction will they be able to effectively exploit technologies that are at least once removed from teaching -- like micro-computers, for example.

Put bluntly and boldly, if teachers have no better appreciation of a true technology of instruction than they do now, they will never be able to even begin to utilize the potentials offered by micro-computers and other new technologies. If they do not truly understand what they are about in a scientifically precise way, these new technologies may only serve to strengthen the impact of incompetence.

The most powerful technology available to teachers today is that which is based upon the psychological and biological principles that underlie human growth and development. Teachers fail to use this information in a systematic way and as a result lack a technological base for their instructional practices. This despite the fact that it is precisely this area of knowledge which could revolutionize and professionalize teaching in the same way that the growth of biological science fostered the creation of the modern physician.

The "New Technology" Applied:

Perhaps our argument will be clearer if we give an example. Perhaps no theorist has provided us as much insight into the area of cognitive development as has Jean Piaget. A teacher not familiar with his theories, and other theories related to the development of thought, is inadequately prepared to do a truly professional job. Lacking knowledge of such important theories seriously hampers the teacher's ability to make the intelligent judgments necessary to match instructional techniques and strategies to the varying needs, interests, and abilities of learners at different developmental levels. That children and adults think differently, and that children at various developmental stages also think differently, is no longer disputed. Not understanding these differences impedes the development of proper instruction which

maximizes the possibility that true learning (as opposed to mere verbal learning) will occur.

Consider the teacher who proudly points to his or her first graders who are correctly adding columns of single digit numbers together. Upon questioning it turns out that these students cannot explain what they are doing and some do not even have the concept of one-to-one correspondence! There is the appearance of learning, but only the appearance not the substance. But the teacher is too conceptually unsophisticated to know what is really taking place. Example after example can be given of teachers who unwittingly force children to do mechanically what they are not yet ready to do with understanding, or who make cognitive demands on children which the children are not yet able to meet. Clearly a teacher who lacks insight into how cognition develops has a lower probability of providing proper instruction to his/her students, no matter what the students' ages. Since a solid grounding in the "new technology" requires an understanding of cognitive development, a teacher so trained would find him or herself able to relate methods and teaching techniques to this development in an intelligent way to facilitate learning.

To reiterate, we are contending that teachers who lack a solid foundation in the technology of teaching, of which cognitive development is one aspect, are ill prepared to intelligently perform their duties let alone distinguish themselves as educators. Further, lacking a technology of their own they are unable to effectively utilize other technologies, either those that currently exist or those yet to be developed. Therefore, they cannot exploit to the maximum the educational advantages these other technologies offer. For instance, micro-computers have been used in a variety of ways in the classroom, but the evidence to date is that in schools fortunate enough to have computers they are being used mostly for drill and practice,

and for tutorial work. This is because the teachers frequently do not know how to go beyond this. It is as if a surgeon who had never mastered anatomy had suddenly been presented with a laser scalpel. Teachers with a solid grounding in educational technology would be quick to realize the potential computers posses for teaching children to think and solve problems. Surgeons with a solid grounding in anatomy can use new technologies with similar skill.

Teachers who truly understand children would not have to look for information to help them apply computer technology in very sophisticated ways. For example, Seymour Papert (1980) and his colleagues developed LOGO, which is a high-level programming language that can be used by children and adults alike. The interesting thing about LOGO is that it is designed to fit children, a rarity in our educational system which usually requires children to fit it. LOGO actually allows children to solve problems and at the same time gain insight into learning and thinking by teaching a "turtle" (which appears as a small triangle on a computer's video monitor) to do things. The point to be made is that computers can be used interactively in the classroom, and teachers who understand the technology of teaching, and therefore cognitive development, will be better equipped and more inclined to use them this way. Such use of computers could go a long way towards helping children to become better problem solvers but this will not happen if teachers lack a technology of teaching.

It is not that any particular technology, such as micro-computers, is developing faster than teachers can learn about them that is the crucial issue before our schools today. The truly crucial issue is the development of a technology of teaching that will enable educators to effectively utilize all new technologies - those that now exist as well as those still undeveloped.

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